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DATE: May 4, 1995

SUBJECT: Review of Sampling and Analysis Plan for Compliance with the Administrative Order On Consent and Scope of Work for West Lake Landfill Operable Unit #2, Bridgeton, Missouri.

TID # 07-9503-566 ICF # 045-05-566-04
METI # 1113-566 ENSV Activity #QQ114
ESAT Doc.# ESAT-VII-566-5021

The documents referenced above were submitted to ESAT and were reviewed according to EPA Region VII ENSV SOP No. 1330.2A. The Sampling and Analysis Plan was comprised of a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The contents of the FSP and QAPP were evaluated for compliance with the Administrative Order On Consent (AOC) and the Statement of Work (SOW) for the site.

The AOC contained the SOW for the site. § 2.3.2, ¶ 2, page 6 of the SOW required of the FSP:

> "shall define in detail the sampling and data-gathering methods that shall be used in performing the RI/FS. It shall include sampling objectives, sample location and frequency, sampling equipment and procedures, and sampling handling and analysis;"

§§ 3.0, 4.0, 6.0, and 7.0 of the FSP adequately and acceptably presented sampling objectives, sample location and frequency, sampling equipment and procedures, and sampling handling and analysis, respectively.

§ 2.3.2, ¶ 2, page 6 of the SOW required of the QAPP:

> "shall describe the project objectives and organization, functional activities, and quality assurance and quality control ("QA/QC") protocols that shall be used to achieve the desired DQOs. In addition, the QAPP shall address sampling procedures, sample custody, analytical procedures, and data reduction, validation, reporting, and personnel qualifications."

For the QAPP, §§ 2.0 and 3.0 described project objectives and organization, including responsibilities; § 2.0, functional activities; § 4.0, QA/QC protocols to achieve DQOs; § 5.0, sampling procedures; § 6.0, sample custody; § 8.0, analytical procedures (§ 7.0, calibration procedures; § 9.0, internal quality control checks; § 11.0, performance/systems audits; § 12.0, preventative maintenance; § 13.0, specific routine procedures to assess data precision, accuracy, and completeness; and § 14.0, corrective action); and § 10.0, data reduction, validation, and reporting.

§ 2.3.2, ¶ 2, page 6 of the Scope of Work also states that:

> "Respondent shall demonstrate, in advance, to EPA's satisfaction, that each laboratory it uses is qualified to conduct the proposed work. The laboratory shall have and follow a QA program approved by EPA. If a laboratory not in the Contract Laboratory Program ("CLP") is selected, methods consistent with CLP methods that would be used for the purposes proposed and QA/QC procedures approved by EPA shall be used. Respondent shall provide assurances that EPA has access to laboratory personnel; equipment; and project records for sample collection, transportation and analysis for the purposes of QA/QC review."

This condition of the Statement of Work is not satisfied by either the FSP or the QAPP. Neither document specifies the analytical laboratory(s) nor the qualifications of laboratory personnel. It is recommended that when an analytical laboratory(ies) is retained that a laboratory specific Quality Assurance Project Plan be submitted for EPA approval. A laboratory specific QAPP would address all aforementioned items and would be included in the RI/FS Work Plan and/or the Sampling and Analysis Plan before the initiation of site activities.

With the exceptions noted above and below, the FSP and the QAPP were found to be adequate and generally acceptable.

Project Organization and Responsibility

Project personnel and associated responsibilities are presented in the QAPP, but not in the FSP. Project personnel, including responsibilities, are presented in the QAPP. There is no line authority diagram presented in the document, however, and feedback mechanisms (pathways for corrective action or consultation) are not identified for the site activities.

Analyte Detection and Quantitation Limits

Required analytical detection limits for all analytes are presented as "Health-Based Criteria" in Tables 4-2, 4-3, 4-4, 4-5, and 4-6 of the FSP and Table 2-2, 2-3, 2-4, 2-5, and 2-6 of the QAPP. According to table footnotes, "actual quantitation limits provided by the laboratory will be equal to or less than the health-based criteria. The actual quantitation limits will be provided by the laboratory in the addendum to the QAPP." With a few exceptions, the detection and quantitation limits of the respective methods are adequate to satisfy site objectives. The desired detection limits for the parameters in the tables below are not attainable with the proposed sampling methodology without compromising accuracy and precision.

Several FSP Table and QAPP Table parameters do not have detection or quantitation limits presented in the methodology. These parameters are: aroclor-1016, aroclor-1221, aroclor-1232, aroclor-1248, aroclor-1254, and aroclor-1260. QAPP Table 2-3 parameters which do not have detection or quantitation limits presented in the methodology include thorium-230, total and dissolved, and uranium-234, 235, and 238, total and dissolved. As such, their detection and quantitation at or below the Health-Based Criteria is not certain.

AQUEOUS SAMPLE PARAMETER LIST

PARAMETER	ANALYTICAL METHOD & MDL/EQL	HEALTH-BASED CRITERIA
1,2-Dibromoethane (Ethylene Dibromide)	SW-846 8260 0.1 µg/L[a][b]	0.075 µg/L
1,2,3-Trichloropropane	SW-846 8260 0.32 µg/L[b]	0.15 µg/L
Benzo(a)anthracene	SW-846 8270 10 µg/L	9.2 µg/L
Benzo(a)pyrene	SW-846 8270 10 µg/L	0.2 µg/L
Benzo(b)fluoranthene	SW-846 8270 10 µg/L	9.2 µg/L
bis(2-Chloroethyl)ether	SW-846 8270 10 µg/L	0.92 µg/L
Dibenzo(a,h)anthracene	SW-846 8270 10 µg/L	0.92 µg/L
3,3'-Dichlorobenzidine	SW-846 8270 20 µg/L	15 µg/L
bis(2-Ethylhexyl)phthalate	SW-846 8270 10 µg/L	6 µg/L
Hexachlorobenzene	SW-846 8270 10 µg/L	0.66 µg/L
Hexachlorocyclopentadiene	SW-846 8270 10 µg/L	0.15 µg/L
Indeno(1,2,3-cd)pyrene	SW-846 8270 10 µg/L	9.2 µg/L
2-Nitroaniline	SW-846 8270 50 µg/L	2.2 µg/L
Nitrobenzene	SW-846 8270 10 µg/L	3.4 µg/L
N-Nitrosodi-n-propylamine	SW-846 8270 10 µg/L	0.96 µg/L
Pentachlorophenol	SW-846 8270 50 µg/L	1 µg/L
Gross Beta, Total and Dissolved	SW-846 9310 4 pCi/L	1 pCi/L

[a] The detection limit for this compound was determined to be 0.1 µg/L when a narrow-bore capillary column was used. With a wide-bore capillary column, the detection limit was determined to be 0.06 µg/L. All other volatile compounds (those not listed in the above table) can be identified and quantitated at or below the Health-based Criteria using either a wide-bore or a narrow-bore capillary column.

[b] The values listed are method detection limits (MDLs). The estimated quantitation limit (EQL) for these parameters is 5 µg/L with a 5 mL purge and 1 µg/L with a 25 mL purge. The EQL is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL and is nominally chosen to simplify data reporting. For many analytes the EQL analyte concentration is selected for the lowest non-zero standard in the calibration curve. Sample EQLs are highly matrix dependent. The EQLs listed herein are provided for guidance and may not always be achievable.

SEDIMENT/SOIL SAMPLE PARAMETER LIST

PARAMETER	ANALYTICAL METHOD & EQL[a][b]	HEALTH-BASED CRITERIA
1,2-Dibromoethane (Ethylene Dibromide)	SW-846 8260 5 mg/Kg	3.4 mg/Kg
Benzo(a)anthracene	SW-846 8270 660 mg/Kg	390 mg/Kg
Benzo(a)pyrene	SW-846 8270 660 mg/Kg	39 mg/Kg
Benzo(b)fluoranthene	SW-846 8270 660 mg/Kg	390 mg/Kg
bis(2-Chloroethyl)ether	SW-846 8270 660 mg/Kg	260 mg/Kg
Dibenzo(a,h)anthracene	SW-846 8270 660 mg/Kg	39 mg/Kg
3,3'-Dichlorobenzidine	SW-846 8270 1300 mg/Kg	640 mg/Kg
2,4-Dinitrophenol	SW-846 8270 3300 mg/Kg	2000 mg/Kg
Hexachlorobenzene	SW-846 8270 660 mg/Kg	180 mg/Kg
Indeno(1,2,3-cd)pyrene	SW-846 8270 660 mg/Kg	390 mg/Kg
2-Nitroaniline	SW-846 8270 3300 mg/Kg	61 mg/Kg
3-Nitroaniline	SW-846 8270 3300 mg/Kg	3100 mg/Kg
Nitrobenzene	SW-846 8270 660 mg/Kg	510 mg/Kg
N-Nitrosodi-n-propylamine	SW-846 8270 660 mg/Kg	41 mg/Kg
Heptachlor epoxide	SW-846 8080 56 mg/Kg	31 mg/Kg
Aroclor-1242	SW-846 8080 44 mg/Kg	37 mg/Kg

[a] The EQL is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL and is nominally chosen to simplify data reporting. For many analytes the EQL analyte concentration is selected for the lowest non-zero standard in the calibration curve. Sample EQLs are highly matrix dependent. The EQLs listed herein are provided for guidance and may not always be achievable.

[b] For Method 8260 analytes in water miscible liquid waste, multiply EQL by 50; in high-concentration soil and sludge multiply EQL by 125; and in non-water miscible waste multiply EQL by 500. For medium-level Method 8270 analytes in soil and sludges by sonicator, multiply EQL by a factor of 7.5. For other Method 8270 analytes in non-water miscible waste, multiply EQL by a factor of 75. For Method 8080 analytes in groundwater, multiply EQL by a factor of 10; in low-concentration soil by sonication with GPC cleanup multiply EQL by 670; in high-concentration soil and sludges by sonication multiply EQL by 10000; and in non-water miscible waste multiply EQL by 100000. The EQLs listed for soil and sediment are based on wet weight. Normally Method 8270 and Method 8080 data is reported on a dry weight basis, therefore, EQLs will be higher based on the % dry weight of each sample. This is based on a 30-g sample and gel permeation chromatography cleanup.

Data Quality Objectives (DQOs)

Regarding completeness, § 4.3, page 4-3 of the QAPP presents numerical completeness goals for the project. The surface water and sediment sample goal is 80% completeness. Since this appears to be a tolerant objective, perhaps critical samples should be identified, or a rationale presented as to why lower completeness will be tolerated for these samples only.

Numerical quality control limits for laboratory accuracy and precision are not presented in either the FSP or the QAPP.

Sample Matrices, Target Analytes

The FSP tables and the QAPP tables list boron as a target analyte, but neither the FSP nor the QAPP present the rationale for inclusion. Boron was not detected during previous investigations and is not a routine analyte for metals analyses. Unless the QAPP presents a rationale for the inclusion of this metal into the target list, the inclusion of boron is subject to question. A plausible reason for including boron in the target list would be if there is reason to believe that hazardous waste from the St. Louis Army Ammunition Plant (nearby) was placed into the landfill. Since elemental boron (approximately 15% in iron oxide) is an ingredient for solid fuel used (or previously used) in the manufacture of munitions at that facility, the chemical analysis for boron would be prudent and justifiable.

Sampling Protocols, Procedures, and Decontamination

Although the FSP and the QAPP comprise the Sampling and Analysis Plan, neither the FSP or the QAPP present detailed sampling procedures.

Laboratory Analytical Methodology, Including Documentation

Although the FSP and the QAPP comprise the Sampling and Analysis Plan, neither the FSP or the QAPP discuss the various analytical methodologies in terms of rationale for implementation, methodology limitations, and methodology modifications. § 2.6, ¶ 2, page 2-5 of the QAPP states that "actual analytical methods will be determined by the appropriate health-based criteria, and will be submitted to the EPA as an addendum to the QAPP." Similarly, § 4.2, page 4-3 of the QAPP states that "SOPs for laboratory analyses will be provided by the chemical analytical laboratory, and will be submitted or referenced in the addendum to the QAPP." The tables in <u>this</u> QAPP present the <u>anticipated</u> methodologies.

Several analytes listed in QAPP tables are not included in the respective methods as target analytes. These analytes, however, can be identified and quantitated by the proposed methodologies if they are present in the calibration and check standards.

Specifically, boron by SW-846 Method 6010; carbazole and di-n-butyl phthalate by SW-846 Method 8270; and endrin ketone by SW-846 Method 8080.

Note that boron is not part of the routine target compound list (TCL) for contract analytical laboratories. If boron is truly a desired analytical parameter, then the contract laboratory must be able to demonstrate that it can determine boron in aqueous and solid matrices, including documentation of an established method detection limit. This issue must be addressed before site activities begin.

Acetone, acrylonitrile, carbon disulfide, trans-1,4-Dichloro-2-butene, 2-hexanone, methyl ethyl ketone (2-butanone), methyl iodide (Iodomethane), methyl isobutyl ketone (4-Methyl-2-pentanone), methylene bromide, and vinyl acetate are listed in the FSP and QAPP tables, but are not listed as target analytes by SW-846 Method 8260. The rationale for this, according to Method 8260, is that low-molecular weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides are more soluble in water, resulting in quantitation limits approximately ten times higher because of poor purging efficiency. These compounds could be better identified and quantitated using SW-846 Method 8015A.

Total petroleum hydrocarbons by Method 8015M is listed as a parameter in the FSP and QAPP tables. However, this reviewer was not able to verify this to be a SW-846 method. Perhaps it is actually supposed to be SW-846 Method 8015A, "Non-Halogenated Volatile Organics by GC," modified to identify and quantitate the compounds neglected by Method 8260, but this is not certain. Also, the rationale for the employment of this method is not specified. Presumably it is proposed because the aforementioned non-halogenated compounds are not listed in Method 8260 and could be more effectively purged using a method such as Method 8015A. If this is the case, the QAPP should clarify this issue and present the necessary modifications to the methodology. The proposed methodology for these compounds as listed should be corrected to reflect Method 8015A (modified). Total petroleum hydrocarbons should then be dropped from the Tables as a proposed analytical parameter as it is redundant.

There appears to be a minor transcription error in the aqueous sample parameter list (Table 4-2 of the FSP; Table 2-2 of the QAPP). The proposed analytical methodology for nitrate/nitrite is listed as 353, but it is actually 353.1.

The FSP and QAPP tables list alpha-Chlordane and gamma-Chlordane as determinable by SW-846 Method 8080. However, using the standards that this method specifies, these compounds cannot be determined individually, but will be determined as "technical chlordane," which is a mixture of alpha-Chlordane, gamma-Chlordane, heptachlor,

nonachlor (cis- and trans-), and chlordenes. Separate standards for these compounds will have to be employed (such as those used in the CLP SOW) or they cannot be accurately identified and quantitated.

As presented in the table above for aqueous parameters, several PAH compounds (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are not determinable at a level that will satisfy the Health-Based Criteria. As such, it is recommended that a high performance liquid chromatography methodology (e.g., SW-846 Method 8310, "Polynuclear Aromatic Hydrocarbons") be employed to determine these compounds in aqueous samples. With fluorescence detection, these compounds are determinable far below the required criteria. Unfortunately though, there is no EPA-approved methodology for PAHs in solid matrices.

For the other parameters presented in the aqueous and soil/sediment tables above, modifications to the proposed methodology will likely be required to meet the proposed criteria. Though larger sample volumes will result in lower quantitation limits, precision will become poorer as the distance between the quantitation limit and the method detection limit is marginalized.

Documentation of laboratory activities is not addressed in the QAPP.

Field and Laboratory Quality Control (QC) Samples, Including Frequency

Laboratory quality control is not addressed in the QAPP. § 4.1, ¶ 7, page 4-2 of the QAPP states that the "level of laboratory QC effort for the testing of the parameters will conform to the Standard Operating Procedures (SOPs) for each respective constituent. These SOPs will be provided or referenced in the addendum to the QAPP."

This completes the ESAT review for this document.

QA Document Review Checklist

Project/Plan Name: West Lake Landfill OU #2, Bridgeton, Missouri

Activity Number: QQ1MS RQAO Document Number: 95170

Deficiencies were found in the elements checked below: (See the attached review report for comments indicated)

1. Project Objective

____	Objective or scope of the data collection activity
____	Intended Use of the data
X	Action level, required detection limits, data quality objectives
____	Project participant/responsibility table; line authority diagram

2. Sampling Procedures

____	Sampling network and rationale
____	Sampling schedule, locations, frequency, duration
____	Sample matrices, target analyte
X	Sampling/Decontamination Procedures
____	Sample containers, preservation, holding times
____	Sample shipment/transportation, Coordination with the lab
____	Sample custody and documentation of field activities

3. Analytical Methods

X	Quality of written procedure or choice of reference
X	MDL, precision, accuracy, comparability
X	Laboratory Documentation

4. Field and Laboratory QC Samples

____	Field QC elements
X	Laboratory QC elements
____	Frequency of QC checks
____	Control limits and corrective actions

5. Data Review, Validation and Reporting

____	Review Process
____	Acceptance/rejection criteria for validation
____	Data Deliverables

QA Reviewer: David Hickey Completion Date: 05-04-95